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The
**WHEAT STEM
SAWFLY and
ITS CONTROL**



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THE WHEAT STEM SAWFLY, a serious insect pest of wheat in the northern Great Plains, originally lived in the large hollow stems of native grasses. With the advent of homesteaders, thousands of acres of native grass sod were plowed and seeded to small grains, particularly spring wheat. This crop proved to be such a favorable sawfly host that damage was soon reported. More recently, certain drastic changes in farming practices have further favored this insect until now it has become one of the major wheat pests in northern Montana east of the Rocky Mountains, in northern and central North Dakota, and in adjoining Canadian provinces. Its presence has also been reported from California to Michigan and as far south as Missouri.

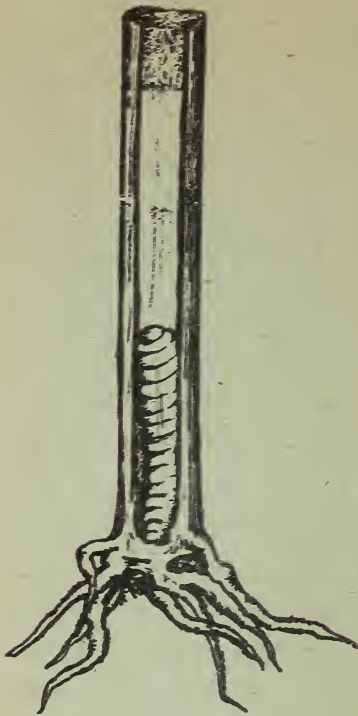
Description and Habits

The sawfly has only one generation a year, consisting of four stages--adult, egg, larva, and pupa. The adults are winged, black, wasplike insects about $\frac{1}{3}$ inch long with yellow bands on their bodies and legs. They emerge in June from cells made by larvae that have overwintered in stubs of the previous year's crop of wheat and grasses. Soon they fly to growing wheat or grass plants, where they deposit whitish eggs about $\frac{1}{24}$ inch long into the tubular hollows within the stems. Adults do not live long, many of them not more than a week.



Sawfly laying an egg in a wheat stem.

The eggs hatch within a week to 10 days and the legless, milk-colored larvae burrow up and down inside the stems until full grown. By that time the stems are filled with brown granular powder and the worms are about $\frac{1}{2}$ inch long, with somewhat S-shaped pale-yellow bodies and dark-brown heads. Although several young larvae are sometimes present in a single stem, they fight and devour each other, until only one is left in a stem. The larvae reach maturity as the grain begins to ripen--the last of July and early in August in North Dakota, but later in the high elevations of Montana. Then they begin to prepare overwintering cells in the base of the stems, in which they remain inactive during the fall and winter. In constructing its overwintering cell the larva cuts a groove around the inside of the stem at about ground level, fills the hollow just below the groove with a tight plug



Wheat stub cut open to show sawfly larva in its overwintering cell.

of its borings, and then lines the cell just below the plug with a thin transparent parchmentlike membrane.

In the spring, during May and June, the overwintered larvae transform to pupae. This period of transformation ranges from a week to 10 days, after which the adults of the next generation appear.

Plants Attacked

Several grasses with large hollow stems, such as western wheatgrass, slender wheatgrass, crested wheatgrass, quackgrass, needlegrasses, foxtail barley, smooth brome, chess, sandgrass, wild-rye, and field timothy, have been found infested with sawfly larvae. Of these grasses, western and slender wheatgrasses, being far

more abundant and favorable than the others, provide most of the grass stems serving as hosts.

Cultivated plants that are attacked include wheat, rye, barley, oats, and flax; however, only wheat and rye are seriously damaged. Although the sawfly lays eggs readily in some varieties of barley, the survival of the larvae that hatch from these eggs is low. Oats are extremely sawfly-resistant. Flax is rarely attacked and larvae never survive in it. Although rye is readily attacked, the total damage to this crop is not serious because of the small acreage seeded each year.

Of the three different types of wheat grown in the infested area--spring, winter, and durum--the spring wheats in general are injured most. Winter wheats in Montana are attacked each year and for a number of years have been damaged considerably. The sawfly has never been a pest of winter wheat, however, in the main Winter Wheat Belt of the Central States. Durum wheats are injured less as a group than are spring wheats, but the amount of damage depends somewhat on varietal characteristics. A number of varieties are readily attacked.

Signs of Injury

Examination of wheat and grass stems for the granular powder produced by the burrowing larvae is a quick and reliable method of determining the presence of the sawfly. Stems weakened by larval tunneling sometimes break over about midway between the head and ground. Girdled

stems break off cleanly at about ground level. Breakage and its accompanying crop loss from either weakened or girdled stems is greatly accentuated by wind and rain. Wheat stems broken by the tunneling and girdling of sawfly larvae are illustrated on the cover page.

Losses

Stem tunneling reduces the weight of the kernels, apparently by obstructing the normal flow of sap to the wheat heads. Crop losses caused by the breaking over of girdled stems are usually more serious than those caused by tunneling. Many of the heads on fallen stems are not recovered during harvest. Usually the greatest number of fallen heads will be found at the margins of the fields.

Control

No single direct control measure, such as the application of an insecticide that will protect wheat from sawfly attack has been developed. Several farm practices have been found to help in overcoming damage. For the greatest protection from sawfly losses, the farmers should practice as many of the following methods as possible.

Early harvesting. --Sawfly losses can be reduced by harvesting early. In August the larvae are most actively engaged in cutting the wheat stems over much of the infested area, and usually the longer harvest is delayed after August, the more stems will fall to the ground. In areas where swathers

and binders are commonly used, as in much of North Dakota, the wheat should be cut while it is still slightly green and just before the infested stems begin to fall. Where wheat is harvested with a combine, as in much of Montana, losses can be reduced by cutting the wheat at the earliest possible date after it has reached maturity. The use of pick-up equipment on the combine, such as reels and teeth, helps to salvage fallen stems.

Shallow cultivation. -- Large numbers of the overwintering sawfly larvae can be killed either by shallow cultivation of the stubble or by plowing it under to a depth of 6 inches or more as soon as possible after harvest. By either of these practices many larvae may be destroyed before they can produce adults to infest young wheat the following summer. Where shallow cultivation is practiced, as much as possible of the stubble should be thrown to the surface of the ground so as to expose the roots and stubs to the air and sun. Such exposure of the stubble causes a drying action which kills the larvae. Shallow tillage properly done early in the fall may kill 70 percent or more of them. Good results have been obtained with one-way disk plows.

Deep plowing. -- Deep plowing with moldboard plows destroys many of the larvae and also traps many of the adults that have developed from surviving larvae. The stubble should be thoroughly buried. The use of a packer pulled behind the plow will greatly assist in breaking the clods, packing

the soil, and covering the stubble more completely. Deep plowing properly done has destroyed about 90 percent of the sawflies in the stubble.

Soil erosion should be considered before deciding whether to practice shallow cultivation or deep plowing. Where soil blowing or washing is a factor, deep plowing should be avoided in favor of shallow tillage. Deep plowings should also be avoided in the sawfly infested areas of Montana, where wireworms are a problem, because the deep, loose soil condition thus produced is more favorable for wireworm activity. However, where soil erosion or wireworm infestation is not a factor a more effective job of control can be done by deep plowing.

Use of resistant crops and rotations. -- The most effective method of avoiding sawfly damage is to grow sawfly-resistant crops. Sawfly-infested fields that are to be recropped the following year, should be seeded to barley, oats, flax, corn, mustard, or other resistant crops. In Montana, where rust is not a serious factor, the sawfly-resistant wheat variety Rescue should be grown if wheat is to be seeded in or near infested fields. Rescue is not recommended for most of North Dakota, however, because of its lack of rust resistance and its failure to yield as well as the common recommended varieties.

Crop rotations assist in holding down sawfly infestations. If rotations are to be effective, wheat must be seeded only on clean summer fallow

or on ground that was in a resistant crop the previous year. Also, the fields to be seeded to wheat should be located as far away as possible from infested stubble.

Community participation.--General participation by the farmers of a community in the use of all the control measures just described will greatly increase their effectiveness. The fact that wheat may become seriously infested from adjacent fields makes it very important that all the fields in a community be kept as free from sawflies as possible. In communities where every farmer applies proper sawfly control measures, the incidence and subsequent damage by this pest will be reduced accordingly.

Practices Not Recommended

Certain practices have been found unsatisfactory because they either increase sawfly damage or offer little in the way of control. Some such practices are as follows:

Stubble burning.--The burning of infested stubble is of practically no value because it destroys few overwintering larvae. They are too far below ground in the short stubs to be affected by the heat. Furthermore, burning destroys the value of the stubble for fertilizer and for preventing erosion.

Seeding wheat on wheat stubble.--The seeding of wheat in fields containing wheat stubble of the preceding season's crop, or "stubbling in," is a

particularly bad practice. Continuous wheat cropping creates an ideal condition for sawfly increase and should be avoided.

Delayed seeding. --In general, delaying the date of seeding wheat to avoid sawfly damage is not practical. To avoid an infestation, the seeding date must be delayed until after May 20, or beyond the time when a normal yield may be expected. This reduction in yield usually more than offsets the loss caused by the sawfly. If, however, it should be desirable for other reasons to seed wheat after May 20, such plantings will escape sawfly damage.

Trap strips. --Narrow bands of early sown wheat and fallowed ground placed around the main wheat plantings in fields, or around the strips to be sown with wheat where fields are strip-cropped, to attract the adult sawflies and prevent them from attacking the main crop, have not proved highly effective. Such trap strips fail to protect the main crop adequately during heavy outbreaks. Their cost, in terms of labor and lost acreage, is usually more than any savings that would accrue from the control of the sawfly.

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